Syferstelsels 144 – Toets 1 – 2004 - memorandum

Vraag 1a

Input carry	Input data A		Input data B		Output carry	Output data S	
C0	A1	A0	B1	B0	C2	S1	S0
0	0	0	0	0	0	0	0
0	0	0	0	1	0	0	0
0	0	0	1	0	0	1	0
0	0	0	1	1	0	1	1
0	0	1	0	0	0	0	1
0	0	1	0	1	0	1	0
0	0	1	1	0	0	1	1
0	0	1	1	1	1	0	0
0	1	0	0	0	0	1	0
0	1	0	0	1	0	1	1
0	1	0	1	0	1	0	0
0	1	0	1	1	1	0	1
0	1	1	0	0	0	1	1
0	1	1	0	1	1	0	0
0	1	1	1	0	1	0	1
0	1	1	1	1	1	1	0
1	0	0	0	0	0	0	1
1	0	0	0	1	0	1	0
1	0	0	1	0	0	1	1
1	0	0	1	1	1	0	0
1	0	1	0	0	0	1	0
1	0	1	0	1	0	1	1
1	0	1	1	0	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	0	0	1	1
1	1	0	0	1	1	0	0
1	1	0	1	0	1	0	1
1	1	0	1	1	1	1	0
1	1	1	0	0	1	0	0
1	1	1	0	1	1	0	1
1	1	1	1	0	1	1	0
1	1	1	1	1	1	1	1

Vraag 1b

Input A		Input B		Output P			
A1	A0	B1	B0	P3	P2	P1	P0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	0	0	0	0
0	1	0	1	0	0	0	1
0	1	1	0	0	0	1	0
0	1	1	1	0	0	1	1
1	0	0	0	0	0	0	0
1	0	0	1	0	0	1	0
1	0	1	0	0	1	0	0
1	0	1	1	0	1	1	0
1	1	0	0	0	0	0	0
1	1	0	1	0	0	1	1
1	1	1	0	0	1	1	0
1	1	1	1	1	0	0	1

Vraag 1c

P3 = A1·A0·B1·B0 uit waarheidstabel

P2:

A1A0\B1B0	00	01	11	10
00				
01				
11				1
10			1	1

P2 = A1·A0'·B1 + A1·B1·B0'

P1:

A1A0\B1B0	00	01	11	10
00				
01			1	1
11		1		1
10		1	1	

P1 = A1·B1'·B0 + A1·A0'·B0 + A1'·A0·B1 + A0·B1·B0'

P0:

A1A0\B1B0	00	01	11	10
00				
01		1	1	
11		1	1	
10				

$P0 = A0 \cdot B0$

<u>Vraag 2a</u>

$(X + Y)' = X' \cdot Y'$

X	**Y**	**LK**	**RK**
0	0	1	1
0	1	0	0
1	0	0	0
1	1	0	0

$(X \cdot Y)' = X' + Y'$

X	**Y**	**LK**	**RK**
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0

Vraag 2b

Vir 'n n-ingang EN hek is:

$$F = X_{n-1} \cdot X_{n-2} \cdots\cdots X_1 \cdot X_0$$

Volgens die assosiatiewe wet kan die verandelikes twee-twee saam ge-EN word en dus

$$F = (X_{n-1} \cdot X_{n-2}) \cdots\cdots (X_1 \cdot X_0)$$

lewer. Hiervoor is dus (n-1) EN-hekke nodig.

Vraag 2c

Vir 'n n+1-ingang OF hek is:

$$F = X_n + X_{n-1} \cdots\cdots X_1 + X_0$$

Indien Xj en Xk aanmekaar verbind word, is $X_j = X_k$ en dus $X_j + X_k = X_j$ bv. Dus word die funksie:

$$F = X_{n-1} \cdots\cdots X_1 + X_0$$

wat 'n n-ingang OF hek is.

Vraag 2d

$$F = ((A + B + C)(A' + B + C'))'$$

$$= (AA' + AB + AC' + A'B + BB + BC' + A'C + BC + CC')' \quad \text{(distrubitiewe wet)}$$

$$= (AB + AC' + A'B + B + BC' + A'C + BC)' \qquad (B + BX = B)$$

$$= (AC' + B + A'C)' \quad \text{of}$$

$$= B'(A' + C)(A + C')$$

3 a) $f(x,y,z) = \sum m(0,1,2,4,5,6)$

$x \backslash yz$	00	01	11	10
0	1	1		1
1	1	1		1

PI'e = EPI'e

$z \backslash xy$	00	01	11	10
0	1	1	∅	1
1	1			1

$f = \bar{y} + \bar{z}$ (SOP)

$x \backslash yz$	00	01	11	10
0			0	
1			0	

~~PI'e = EPI'e~~

$f = (\bar{y} + \bar{z})$ (POS)

b) $f(abcd) = \sum m(0,2,6,8,9,10,12,13)$

$ab \backslash cd$	00	01	11	10
00	1			1
01				1
11	1	1		
10	1	1		1

1 PI'e = EPI'e

$f = \bar{b}\bar{d} + a\bar{c} + \bar{a}c\bar{d}$ (SOP)

$ab \backslash cd$	00	01	11	10
00		0	0	
01	0	0	0	
11			0	0
10			0	

1 PI'e = EPI'e

$f = (a + \bar{b} + c)(a + \bar{d})(\bar{c} + \bar{d})(\bar{a} + b + \bar{c})$ (POS)

3 c) $f(a,b,c,d) = \sum m(0,2,3,8,9,10) + d(1,5,7,11,13,15)$

ab \ cd	00	01	11	10
00	1	d	1	1
01		d	d	
11		d	d	
10	1	1	d	1

$f = \bar{b}$ (SOP).

ab \ cd	00	01	11	10
00		d		
01	0	d	d	0
11	0	d	d	0
10			d	

$f = \bar{b}$ (POS)

$\boxed{10}$

4 a)

$$\begin{array}{r} 1111_2 \\ 101_2 \\ \hline 10100_2 \end{array} \longrightarrow$$

2'c

$$\begin{array}{r} 001111 \\ 000101 \\ \hline 010100_2 \end{array} \longrightarrow$$

Token bis.

b)

$$\begin{array}{r} 00F4F_{16} \\ -\ 00123_{16} \\ \hline 0E2C_{16} \end{array} \longrightarrow$$

$0F4F_{16}$ 0111101001111

0123_{16} 0000100100011

-0123_{16} 1111011011101 +

$$\cancel{X}0111000101100 \longrightarrow$$

Token bis

c)

$$\begin{array}{r} 0234_5 \\ 43_5 \\ \hline 0141_5 \end{array} \longrightarrow$$

$234_5 = 2\times5^2+3\times5^1+4\times5^0 = 69_{10} = 01000101_2$

$43_5 = 4\times5^1+3\times5^0 = 23_{10} = 010111_2$

$= 00010111_2$

$-43_5 = 11101001_2$

Token bis

$$\begin{array}{r} 01000101 \\ +\ 11101001 \\ \hline \cancel{X}\,00101110_2 \end{array} \longrightarrow$$

Token bis

4 d) 100_{10}
$- 187_{10}$
$- 87_{10} \longrightarrow$

$100_{10} = 0011001000_2$
$187_{10} = 010111011_2$
$-187_{10} = 101000101_2$

$$\begin{array}{r} 0011001000 \\ +\ 101000101 \\ \hline 1101010001_2 \end{array} \longrightarrow$$

Take bis $\longrightarrow$

$\boxed{10}$

5. a)

$$
\begin{array}{r}
{\scriptstyle c_8=1\ c_7=1\ c_6} \\
10010011 \\
+\ 01101101 \\
\hline
\cancel{1}\ 00000000
\end{array}
$$

$c_8=1$, $c_7=1$ $\therefore$ Neg.

b)

$$
\begin{array}{r}
{\scriptstyle c_8=1\ c_7=0} \\
10011011 \\
+\ 10011011 \\
\hline
\cancel{1}\ 00110110
\end{array}
$$

$C_8=1$, $C_7=0$ $\therefore$ Fatal

$$
\begin{array}{r}
{\scriptstyle c_9=1\ c_8=1} \\
110011011 \\
110011011 \\
\hline
\cancel{1}\ 100110110
\end{array}
$$

$c_9=1$, $C_8=1$ $\therefore$ Neg

c)

$$
\begin{array}{r}
{\scriptstyle c_8=1\ c_7=0} \\
10010011 \\
+\ 10010011 \\
\hline
\cancel{1}\ 00100110
\end{array}
$$

01101101
10010010 + 1

$c_8 \neq c_7$ $\therefore$ Fat

$c_9=1 \quad c_8=1$

$$
\begin{array}{r}
1100100111 \\
+\ 1100100111 \\
\hline
\cancel{1}\,1001001110
\end{array}
$$

$c_9 = c_8 \therefore$ Reg

d) $c_8=1 \quad c_7=1$

$$
\begin{array}{r}
11111101 \\
+\ 10010011 \\
\hline
\cancel{1}\,10010000
\end{array}
$$

01101101

10010010 +1

$c_8 = c_7 \therefore$ Reg

6

Y3

EN \ $I_1 I_0$	00	01	11	10
0	0	0	0	0
1	0	0	1	0

$$Y3 = EN \cdot I_1 \cdot I_0$$

Y2

EN \ $I_1 I_0$				10
	0	0	0	0
	0	0	0	1

$$Y_2 = EN \cdot I_1 \overline{I_0}$$

Y1

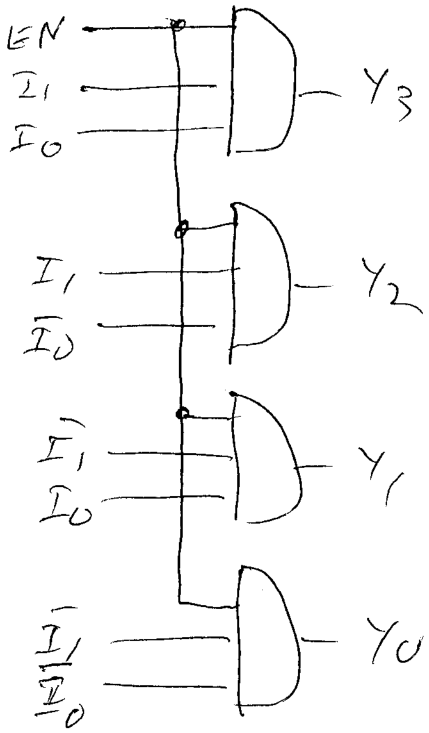
		01		
0				
1		1		

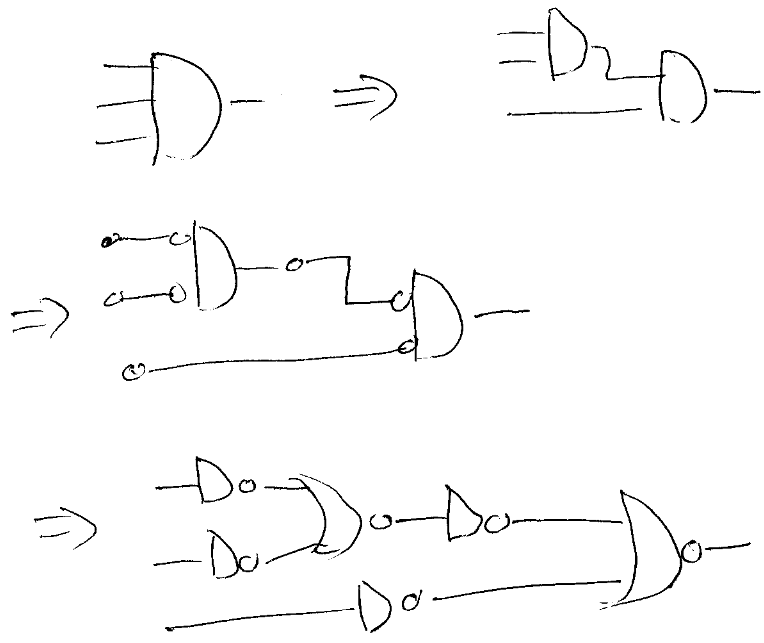
$$Y_1 = EN \cdot \overline{I_1} I_0$$

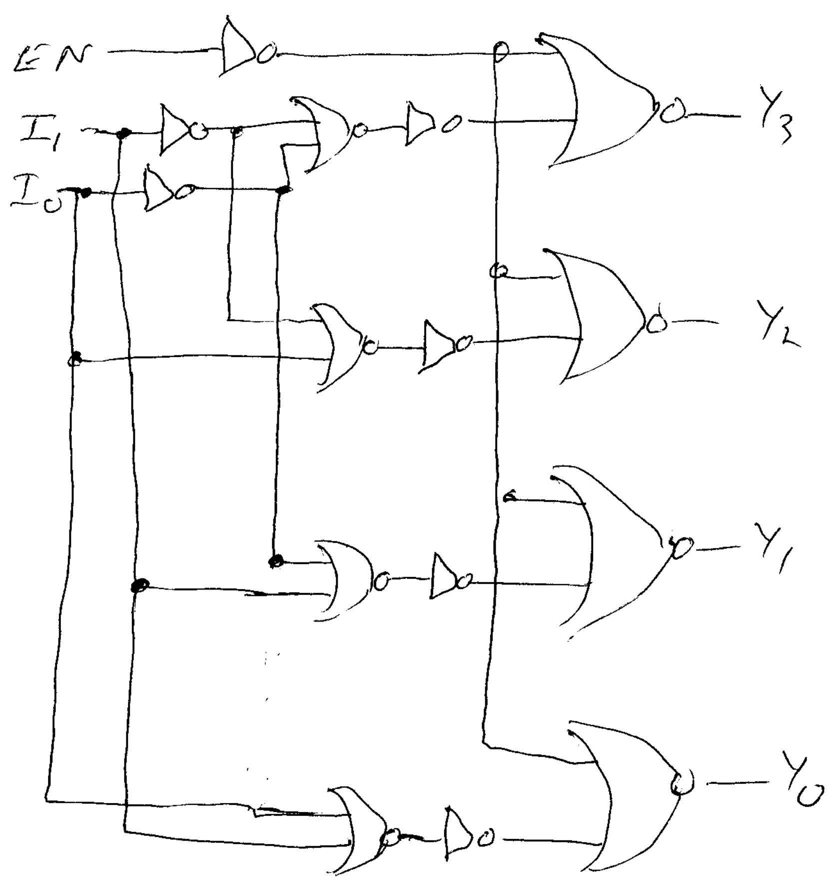
Y0

	00			
	0	0	0	0
	1	0	0	0

$$Y_0 = EN \cdot \overline{I_\phi} \overline{I_0}$$


EN
I1
I0
Y3
I1
I0
Y2
I1
I0
Y1
I1
I0
Y0




EN
I1
I0
Y3
Y2
Y1
Y0